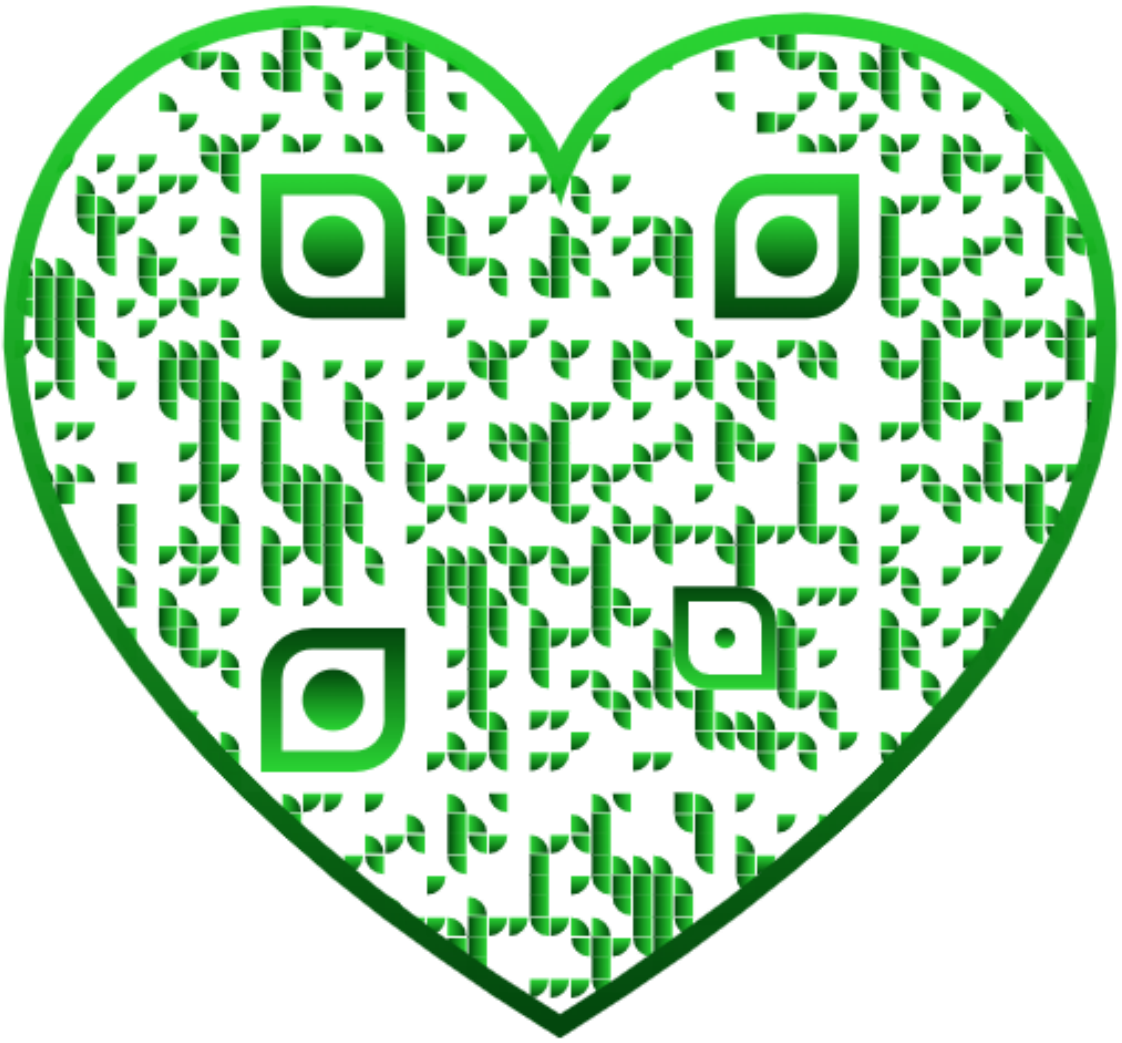
Infectious diarrhoea



Intro….

- Infectious diarrhea is caused by the ingestion of **food** or **water** contaminated with pathogenic microorganisms
- GI infections encompass a wide variety of syndromes from **mild gastroenteritis** to life-threatening systemic infections.
  - Dehydration from GI infections is the second leading cause of morbidity and mortality worldwide,

- A variety of pathogens are responsible for acute infectious diarrhea
- Viruses are suspected to be the most common cause of gastroenteritis, especially in children
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WHO defined

- Diarrhoea as having 3 or more loose or liquid stools per day, or as having more stools than is normal for that person (>200mg)
- Diarrhea is usually a symptom of an infection in the intestinal tract, which can be caused by a variety of bacterial, viral and parasitic organisms.

Classification

Based on duration

- Acute diarrhea <2 weeks
- Persistent diarrhea >14 days, and
- Chronic diarrhea if the illness lasts >30 days

Acute Diarrhea

- >90% caused by infectious agents.
- Remaining 10%
  - medications,
  - toxic ingestions,
  - ischemia

Classification

Non-inflammatory diarrhoeas

- Generally a less severe illness
- Patients present with non-bloody and watery stools
- Patients are afebrile and without significant abdominal pain.
- fecal WBC or occult blood not seen in stool specimens
- Typically caused by rotaviruses, noroviruses, Staphylococcus aureus, Bacillus cereus, Clostridium

Inflammatory diarrheas

- Generally a more severe illness
- Present with bloody diarrhea,
- Severe abdominal pain, and fever,
- Large numbers of fecal leukocytes present in stool specimens
- Caused by invasive pathogens including Campylobacter jejuni, Shigella species, Salmonella species, Clostridium difficile, Shiga toxin-producing Escherichia coli (STEC)

Pathogenesis

Bacterial Virulence Factors

- Enteropathogens possess a number of virulence factors, including toxins, adhesions, and invasive properties that contribute to the organism's pathogenicity
- Enterotoxins target the small bowel, causing net movement of fluid into the gut lumen leading to voluminous quantities of watery stools and potentially

Pathogenesis

- Watery diarrhea can also be caused by an alteration in the absorptive function of the villus tip, as seen with rotaviruses and noroviruses.
- Cytotoxins target the colon, causing direct mucosal damage leading to fever and bloody diarrhea
- The invasive properties identified in Shigella species and invasive strains of E. coli allow these bacteria to invade and destroy epithelial cells causing bloody or mucoid stools.

Pathogenesis

Host Defenses

- The human GI possesses numerous **defense mechanisms** to protect against enteric infection
  - The normal **gastric acidity** of the stomach prevents viable pathogens from passing from the stomach into the small intestine
  - **Intestinal peristalsis** moves bacteria and their toxins along and out of the GI tract.

Pathogenesis

- GI mucus and mucosal tissue integrity provide physical barriers against infection.
- Intestinal immunity, including the local production of antibody, contributes to the host's ability to resist enteric infection.
- The normal bacterial flora compete for space and nutrients with potentially pathogenic organisms, or produce substances that may be inhibitory to

Pathogenesis

Predisposing Factors include

- Travel history,
- Compromised immune status,
- Exposure to outbreaks of foodborne or waterborne illnesses,
- Poor personal hygiene, and
- The use of pharmacologic agents

- Outbreaks of diarrheal illnesses should raise suspicions of illness caused by S. aureus, B. cereus, C. perfringens, Shigella, Salmonella, Campylobacter,

Clinical presentation

Sign and symptom

- Frequent loose, watery stools
- Abdominal pain
- Fever
- Bleeding
- Light headedness or dizziness from dehydration

Investigations

- The cornerstone of diagnosis in severe acute infectious diarrhea is **microbiologic analysis of the stool.**
  - cultures for bacterial and viral pathogens,
  - direct inspection for ova and parasites
  - immunoassays for certain bacterial toxins (*C.difficile*), viral antigens (rotavirus), and protozoal antigens (*Giardia*, *E. histolytica*).

Approach to the Patient: Acute Diarrhea

- Most episodes of acute diarrhea are mild and self-limited
  - profuse diarrhea with dehydration,
  - grossly bloody stools
  - fever 38.5°C (101°F)
  - duration >48 h without improvement
  - six or more unformed stools within a 24-hour period
  - New community outbreaks,
  - Associated severe abdominal pain in patients >50 years,

Treatment: Acute Diarrhea

- Infectious diarrhea is generally a self-limiting illness, and most patients never seek medical attention
- Fluid and electrolyte replacement are of central importance to all forms of acute diarrhea.
- Profoundly dehydrated patients, especially infants and the elderly, require IV rehydration

Rehydration Therapy

- Fluid replacement is the cornerstone of therapy for diarrhea regardless of etiology
- Initial assessment of fluid loss is essential for rehydration.
- Weight loss is the most reliable means of determining the extent of water loss
- Complications of infectious diarrhea most commonly include dehydration and electrolyte losses

WHO ORS

- Sodium chloride 2.6 gm/lt
- Glucose, anhydrous 13.5 gm/lt
- Potassium chloride 1.5 gm/lt
- Trisodium citrate, dihydrate 2.9 gm/dl

Antibiotics

- Reduce severity and duration of diarrhea.
- Treat empirically without diagnostic evaluation using a quinolone, such as ciprofloxacin (500 mg bid for 3–5 d).
- Empirical treatment can also be considered for suspected giardiasis with metronidazole (500 mg tid for 7 d)

- In moderately severe nonfebrile and non-bloody diarrhea, antimotility and antisecretory agents such as loperamide can be useful adjuncts to control symptoms.
- Such agents should be avoided with febrile dysentery, which may be exacerbated or prolonged by them.

Invasive (Dysentery-like) Diarrhea

- Dysentery is a severe manifestation of inflammatory diarrhea characterized by bloody or mucoid stools, abdominal cramps, and painful straining when passing stools

Bacillary Dysentery (Shigellosis)

- Four species of Shigella are most often associated with disease: S. dysenteriae type I, S. flexneri, S. boydii, and S. sonnei.
- Poor sanitation, poor personal hygiene, inadequate water supply, malnutrition, and increased population density are associated with increased risk of Shigella gastroenteritis epidemics

- The majority of cases are thought to result from fecal–oral transmission
- Shigella spp. cause dysentery upon penetrating the epithelial cells lining the colon
- Initial signs and symptoms include abdominal pain, cramping, and fever followed by frequent watery stools

- Within a few days, patients experience a decrease in fever, severe abdominal pain, and tenderness prior to the development of bloody diarrhea
- If untreated, bacillary dysentery usually lasts about 1 week (range 1 to 30 days).

Treatment

- Shigellosis is usually a self-limiting disease and most patients recover in 4 to 7 days.
- Treatment of bacillary dysentery generally includes correction of fluid and electrolyte disturbances and antimicrobial
- Fluid and electrolyte losses can generally be replaced with oral therapy, as dysentery is generally not associated with significant fluid loss

Antibiotics

- Effective antimicrobial therapy for shigellosis has several benefits.
- First, effective therapy reduces the average duration of illness from 5–7 days to about 3 days.
- Within 48 hours of starting treatment, patients can expect to experience decreases in stool frequency, the volume of bloody stools, and fever, and an improved appetite

Fluoroquinolone

Ciprofloxacin is recommended for the treatment of shigellosis in both children (15 mg/kg orally twice daily for 3 days) and adults (500 mg orally twice daily for 3-5 days).

Alternative

Azithromycin, TMP-SMX, ceftriaxone

SALMONELLOSIS

- Human disease caused by Salmonella generally falls into four categories:
  - Acute gastroenteritis (enterocolitis),
  - Bacteremia,
  - Extraintestinal localized infection, and
  - Enteric fever (typhoid and paratyphoid fever), and
  - A chronic carrier state.
- ü S. typhimurium is the most common cause of salmonellosis.
- ü Salmonellosis is a disease primarily of infants,

Clinical Presentation

- Most patients experience symptoms within 72 hours of ingestion of contaminated food or water
- Patients often complain of nausea and vomiting followed by abdominal cramps, headache, fever, and diarrhea
- Stools generally are loose and may be mucoid or bloody

(dysentery-like) or both

- Stool cultures inevitably yield the causative organism, if obtained early.
- However, recovery of organisms continues to decrease with time so that by 3 to 4 weeks, only 5% to 15% of adult patients are passing Salmonella
- Enteric fever caused by S. typhi is called typhoid fever. If caused by any other serotype, it is referred to as paratyphoid fever

Clinical presentation

- Nonspecific symptoms of fever, dull headache, malaise, anorexia, and myalgias are most common. Initially, fever tends to be remittent but gradually progresses over the first week to temperatures that are often sustained over 40°C.
- Other frequently encountered symptoms include chills, nausea, vomiting, cough, weakness, and sore throat

Diagnosis

- About 80% of patients with enteric fever have positive blood cultures.
- Bacteremia persists in about one-third of patients for several weeks if not treated.

Treatment

- Most patients with enterocolitis require no therapeutic intervention.
- The most important part of therapy for Salmonella enterocolitis is fluid and electrolyte replacement.
- Antimotility drugs should be avoided because they increase the risk of mucosal invasion and complications

Antibiotics should be used in

- Neonates or infants younger than 6 months,
- Patients with primary or secondary immunodeficiency,
- Severely symptomatic patients with fever and bloody diarrhea

- Recommended antibiotics with adult doses include: Fluoroquinolones, trimethoprim–sulfamethoxazole, ampicillin, third generation cephalosporins

- For bacteremia, life-threatening treatment should include the combination of a third-generation cephalosporin (ceftriaxone 2 g IV daily) and ciprofloxacin 500 mg orally twice daily.
- Fluoroquinolones such as ciprofloxacin (500 mg orally twice daily for 10 days in adults) are the drugs of choice for enteric fever, particularly in areas where multidrug resistance is common

Enterotoxigenic (Cholera-like) Diarrhea

Cholera (Vibrio cholera)

- Vibrio cholerae 01 is the serogroup that most often causes human epidemics and pandemics.
- Four mechanisms for transmission have been proposed: Animal reservoirs, chronic carriers, asymptomatic or mild disease victims, or water reservoirs

- Most pathology of cholera is thought to result from an enterotoxin that increases cyclic adenosine monophosphate–mediated secretion of chloride ion into the intestinal lumen
- Which results in isotonic secretion (primarily in the small intestine) exceeding the absorptive capacity of the intestinal tract (primarily the colon).

- The incubation period of V. cholerae is 1 to 3 days.
- Cholera is characterized by a spectrum from the asymptomatic state to the most severe typical cholera syndrome.
- Patients may lose up to 1 L of isotonic fluid every hour.

Treatment

- The mainstay of treatment for cholera consists of fluid and electrolyte replacement with ORT to restore fluid and electrolyte losses
- Rice-based rehydration formulations are the preferred ORT for cholera patients
- In patients who cannot tolerate ORT, IV therapy with Ringer's lactate can be used.

- Antibiotics shorten the duration of diarrhea, decrease the volume of fluid lost, and shorten the duration of the carrier state
- In children younger than 7 years of age, trimethoprim–sulfamethoxazole the preferred drug
- In areas of high tetracycline resistance, fluoroquinolones are effective.

ESCHERICHIA COLI

- Escherichia coli GI disease may be caused by enterotoxigenic E. coli (ETEC), enteroinvasive E. coli, enteropathogenic E. coli, enteroadhesive E. coli, and enterohemorrhagic E. coli.
- These E. coli bacteria cause a spectrum of infection, including asymptomatic carriage, mild and nonbloody diarrhea, bloody diarrhea (hemorrhagic colitis), and thrombotic thrombocytopenia purpura

- Shiga toxin-producing Escherichia coli is most commonly spread by consumption of undercooked beef products that are contaminated with E. coli
- ETEC is capable of producing two plasmid-mediated enterotoxins: heat labile toxin and heat-stable toxin.
- The net effect of either toxin on the mucosa is production of a cholera-like secretory diarrhea

- Nausea and watery stools, with or without abdominal cramping, are characteristic of the disease caused by ETEC
- Most ETEC diarrhea is typically abrupt in onset and resolves within 24 to 48 hours without complication.

Treatment

- Most cases respond readily to ORT, and although antibiotic therapy is seldom necessary
- Ciprofloxacin 500 mg orally twice daily × 3 days
- Trimethoprim–sulfamethoxazole DS tablet every 12 hours

Pseudomembranous Colitis (Clostridium Difficile)

- Pseudomembranous colitis (PMC) results from toxins produced by Clostridium difficile
- It occurs most often in epidemic fashion and affects high risk groups such as the elderly, debilitated patients, cancer patients, surgical patients, any patient receiving antibiotics, patients with nasogastric tubes, or those who frequently use laxatives

- PMC has been associated most often with broad-spectrum antimicrobials, including clindamycin, ampicillin, or third-generation cephalosporins.
- PMC may result in a spectrum of disease from mild diarrhea to enterocolitis
- In colitis without pseudomembranes, patients present with malaise, abdominal pain, nausea, anorexia, watery diarrhea, low-grade fever, and leukocytosis

- With pseudomembranes, there is more severe illness with severe abdominal pain, perfuse diarrhea, high fever, and marked leukocytosis

Diagnosis

- is made by colonoscopic visualization pseudomembranes, finding cytotoxins A or B in stools, or stool culture for C. difficile.

Treatment

- Initial therapy of PMC should include discontinuation of the offending agent.
- The patient should be supported with fluid and electrolyte replacement.
- Both vancomycin and metronidazole are effective, but metronidazole 250 mg orally four times daily is the drug of choice.

- Oral vancomycin, 125 mg orally four times daily, is second-line therapy
- It should be reserved for patients not responding to metronidazole, organisms resistant to metronidazole, patients allergic or intolerant to metronidazole

The End!